REMARKS

Claims 22 and 24-37 are pending in the application. In the Office Action dated February 19, 2002, the Examiner took the following action: (1) rejected claims 22 and 24-37 under 35 U.S.C. § 103(a) as being unpatentable over Park et al. (U.S. 5,296,400) in view of Poppert et al. (U.S. 4,593,459); (2) rejected claims 22, 24, 25, 28, 29, and 32-37 under 35 U.S.C. § 103(a) as being unpatentable over Noguchi et al. (U.S. 4,935,802) in view of Poppert et al..

Applicants respectfully request reconsideration of the application in view of the following remarks. Some of the technical differences between the applied references and embodiments of the invention will now be discussed. Of course, these discussed differences, which are disclosed in detail in the patent specification, do not define the scope or interpretation of any of the claims. Where presented below, such discussed differences merely help the Examiner appreciate important claim distinctions discussed thereafter.

Generally, the disclosed embodiments are directed to methods and apparatus having trench isolation structures with reduced isolation pad heights and reduced edge spacers. In one embodiment, an microelectronic device comprises a microelectronic substrate having a surface, a gate structure including a gate oxide layer formed on the surface of the substrate, a first gate layer formed on the gate oxide layer, and an adhesion layer formed on the first gate layer. The gate structure has a trench at least partially disposed therein and extending into the substrate substantially perpendicularly to the surface of the substrate, and a field oxide layer is at least partially in the trench. The field oxide layer has sides that are substantially straight and substantially parallel from a bottom of the trench to a top surface of the field oxide layer, the substantially straight sides not contacting the gate oxide layer and extending upwardly from the trench and not extending laterally from the trench over an upper surface of the substrate, the field oxide layer having a field oxide level between the level of the upper surface of the substrate and the level of an upper surface of the first gate layer.

In an alternate embodiment, Applicants teach a microelectronic device comprising a microelectronic substrate having a trench formed in a surface thereof, the trench extending into the substrate substantially perpendicularly to the surface of the substrate, and a field oxide in the trench. The field oxide has sides that are substantially straight and substantially parallel from a bottom of the trench to a top surface of the field oxide layer, the substantially straight sides

projecting outwardly from the trench substantially perpendicularly to the surface of the substrate beyond the surface of the substrate and not extending laterally from the trench over the surface of the substrate. A component is formed on the field oxide, the component extending from the field oxide by a height at least equal to approximately two times a height that the field oxide extends from the trench beyond the surface of the substrate.

The microelectronic structures taught by Applicants provide several advantages over prior art structures. Because the height of the field oxide "isolation pad" is reduced compared with the height of the gate structure, edge spacers that may otherwise form along the edges of the isolation pad are reduced or eliminated. Furthermore, because the field oxide has substantially straight sides not extending laterally from the trench over the surface of the substrate, the field oxide isolation pad occupies less space on the substrate which is critical to the design of highly integrated microelectronics devices.

<u>Park et al.</u>

Park et al. (U.S. 5,296,400) teaches methods of manufacturing semiconductor devices. According to Park et al., a semiconductor device includes a substrate 1, and a transistor having a gate oxide layer 4 formed on the substrate 1 and a gate electrode 5 formed on the gate oxide layer 4 (see Figure 1A). Park et al. further teaches a field oxide layer 3 formed in the substrate 1 by a conventional LOCOS method. As best shown in Figure 1A of Park et al., the field oxide layer 3 has a rounded "bird's peak" shape typical of LOCOS methods.

Park et al. does not teach or suggest the microelectronics structures taught by Applicants. Specifically, Park et al. does not teach or suggest microelectronics structures including a field oxide layer *having sides that are substantially straight and substantially parallel from a bottom of the trench to a top surface of the field oxide layer*. According to the teachings of Park et al., the sides of the field oxide layer 3 are not substantially parallel from a bottom of the trench to a top surface of the field oxide. Rather, the field oxide 3 of Park et al. exhibits the generally rounded or "bird's beak" shape typical of conventional LOCOS processes.

Furthermore, because Park et al. teaches that the field oxide layer 3 is formed using a LOCOS process, there is no trench formed in the substrate that is filled with field oxide, as taught by Applicants. For this additional reason, Park et al. does not teach or fairly suggest the structures taught by Applicants.

Poppert et al.

Poppert et al. (U.S. 4,593,459) teaches a monolithic integrated circuit structure including gate members 53, 54 formed on gate insulating layers 51, 52, respectively (Figure 8). Poppert et al. further teaches a silicon dioxide region 48 formed in a trench 46 (Figure 7) with silicon dioxide portions 40 formed on opposite sides thereof. The silicon dioxide portions 40 extend from the silicon dioxide region 48 outwardly over the edges of the trench 46, and are in contact with the gate insulating layers 51, 52 (Figure 8). As best shown in Figure 8, the silicon dioxide region 48 extends upwardly from the surface of the substrate to a level that is approximately equal to the upper surface of the gate members 53, 54, while the silicon dioxide portions 40 extend to levels that are higher than the upper surfaces of the gate members 53, 54.

Poppert et al. does not remedy the above-noted absent teachings of Park et al., and does not disclose or fairly suggest the microelectronics structures taught by Applicants. Specifically, Poppert et al. does not teach or suggest microelectronics structures including a field oxide layer *having sides that are substantially straight and substantially parallel from a bottom of the trench to a top surface of the field oxide layer*. According to the teachings of Poppert et al., silicon dioxide portions 40 are engaged with the silicon dioxide region 48 and extend outwardly over the sides of the trench 46. Therefore, Poppert et al. teaches away from Applicants' novel structures which include a field oxide layer with straight side walls that do not extend laterally from the trench over the upper surface of the substrate.

Also, the field oxide portions 40 taught by Poppert et al. are in contact with the gate insulating layers 51, 52 of the gate structures. For this additional reason, Poppert et al. teaches away from the novel microelectronics structures taught by Applicants in which the field oxide layer does not contact the gate oxide layers of the local gate structures.

In addition, the silicon dioxide portions 40 of Poppert et al. extend upwardly to a level that is greater than the level of the upper surface of the gate members 53, 54. For this additional reason, Poppert et al. teaches away from the structures taught by Applicants, which require that the field oxide layer extend upwardly from the trench to a field oxide level between the level of the upper surface of the substrate and the level of an upper surface of the first gate layer.

Thus, while the combination of Park et al. in view of Poppert et al. still fails to teach or suggest Applicants' inventive structures, Applicants respectfully submit that there is no motivation to combine the teachings of Park et al. with the teachings of Poppert et al.. The mere fact that references can be combined does not render the resultant combination obvious unless the prior art also objectively suggests the desirability of the resulting combination. *In re Mills*, 916 F.2d 680, 16 U.S.P.Q.2d 1430 (Fed. Cir. 1990); *In re Kotzab*, 217 F.3d 1365, 55 U.S.P.Q.2d 1313 (Fed. Cir. 2000). In this case, there is no motivation to combine the teachings of Poppert et al. with the teachings of Park et al..

Park et al. involves a conventional LOCOS process that does not involve forming a trench in a substrate and produces the familiar "birds beak" field oxide shape. On the other hand, Poppert et al. teaches the opposing approach of using a trench isolation process. Since trench isolation processes are substantially different processes from conventional LOCOS processes, there is no motivation to combine the teachings of Poppert et al. with the teachings of Park et al.. Furthermore, because Poppert et al. teaches away from structures wherein the field oxide layer (1) does not extend laterally from the trench over the upper surface of the substrate; (2) does not contact the gate oxide layers of the local gate structures; and (3) extends upwardly from the trench to a field oxide level between the level of the upper surface of the substrate and the level of an upper surface of the first gate layer, there is no motivation to combine the teachings of Poppert et al. with the teachings of Park et al. to arrive at Applicants' invention. Thus, the combination of these references is the result of impermissible hindsight analysis.

Noguchi et al.

Noguchi et al. (U.S. 4,935,802) teaches methods of manufacturing semiconductor devices. According to Noguchi et al., a semiconductor device includes a substrate 5, and a transistor 20 having a gate layer 2 formed on the substrate 5 and a gate electrode 3 formed on the gate layer 2 (see Figure 2). Noguchi et al. further teaches a field insulating layer 4 formed in the substrate 5 by a conventional LOCOS method.

Noguchi et al. does not remedy the above-noted absent teachings of Park et al. and Poppert et al.. Specifically, Noguchi et al. does not teach or suggest microelectronics structures including a field oxide layer *having sides that are substantially straight and substantially parallel from a bottom of the trench to a top surface of the field oxide layer.*

According to Noguchi et al., the sides of the field insulating layer 4 are not substantially parallel from a bottom of the trench to a top surface of the field oxide. Rather, the field insulating layer 4 of Noguchi et al. exhibits the generally rounded or "bird's beak" shape typical of conventional LOCOS processes.

Furthermore, because Noguchi et al. teaches that the field insulating layer 4 is formed using a LOCOS process, there is no trench formed in the substrate that is filled with field oxide, as taught by Applicants. For this additional reason, Noguchi et al. does not teach or suggest the structures taught by Applicants.

Again, as with Park et al., there is no motivation to combine the teachings of Noguchi et al. with the teachings of Poppert et al.. The mere fact that references <u>can</u> be combined does not render the resultant combination obvious unless the prior art also objectively suggests the desirability of the resulting combination. *In re Mills*, 916 F.2d 680, 16 U.S.P.Q.2d 1430 (Fed. Cir. 1990); *In re Kotzab*, 217 F.3d 1365, 55 U.S.P.Q.2d 1313 (Fed. Cir. 2000). In this case, there is no motivation to combine the teachings of Poppert et al. with the teachings of Noguchi et al..

Noguchi et al. involves a conventional LOCOS process that does not involve forming a trench in a substrate and produces the familiar "birds beak" field oxide shape. On the other hand, Poppert et al. teaches the opposing approach of using a trench isolation process. Since trench isolation processes are substantially different processes from conventional LOCOS processes, there is no motivation to combine the teachings of Poppert et al. with the teachings of Noguchi et al.. Furthermore, because Poppert et al. teaches away from structures wherein the field oxide layer (1) does not extend laterally from the trench over the upper surface of the substrate; (2) does not contact the gate oxide layers of the local gate structures; and (3) extends upwardly from the trench to a field oxide level between the level of the upper surface of the substrate and the level of an upper surface of the first gate layer, there is no motivation to combine the teachings of Poppert et al. with the teachings of Noguchi et al. to arrive at Applicants' invention. Thus, Applicants respectfully submit that the combination of these references is the result of impermissible hindsight analysis.

I. *Rejection of claims 22 and 24-37 under 35 U.S.C. § 103(a) as being unpatentable over Park et al. (U.S. 5,296,400) in view of Poppert et al. (U.S. 4,593,459), and the rejection of claims 22, 24, 25, 28, 29, and 32-37 under 35 U.S.C. § 103(a) as being unpatentable over Noguchi et al. (U.S. 4,935,802) in view of Poppert et al..*

Claim 22, 24-25, and 35-37

Turning now to the specific language of the claims, claim 22 recites a microelectronic device comprising a microelectronic substrate having an upper surface; a gate structure including a gate oxide layer formed on the upper surface of the substrate, a first gate layer formed on the gate oxide layer, and an adhesion layer formed on the first gate layer, *the gate structure having a trench at least partially disposed therein and extending into the substrate substantially perpendicularly to the upper surface* of the substrate; and a field oxide layer at least partially in the trench, *the field oxide layer having sides that are substantially straight and substantially parallel from a bottom of the trench to a top surface of the field oxide layer*, the substantially straight sides not contacting the gate oxide layer and *extending upwardly from the trench substantially perpendicularly to the upper surface of the substrate and not extending laterally from the trench over the upper surface of the substrate*, the field oxide layer having a field oxide level between the level of the upper surface of the substrate and the level of an upper surface of the first gate layer. (emphasis added).

As described more fully above, the combination of Park et al. and Poppert et al., as well as the combination of Noguchi et al. and Poppert et al., does not disclose, teach or fairly suggest the microelectronics device recited in claim 22. Specifically, the combination of cited references does not teach or suggest a microelectronics device including a field oxide layer *having sides that are substantially straight and substantially parallel from a bottom of the trench to a top surface of the field oxide layer.* According to both Park et al. and Noguchi et al., the sides of the field oxide layer are not substantially parallel from a bottom of the trench to a top surface of the field oxide, but rather, have a rounded or "bird's beak" shape typical of conventional LOCOS processes. Similarly, Poppert et al. teaches that the silicon dioxide portions 40 are engaged with the silicon dioxide region 48 and extend outwardly over the sides of the trench 46. Therefore, the combination of Park et al. in view of Poppert et al., as well as

the combination of Noguchi et al. in view of Poppert et al., fails to teach or suggest the assembly recited in claim 22.

Furthermore, as described more fully above, Poppert et al. teaches away from the assemblies recited in claim 22. Specifically, Poppert et al. teaches away from structures wherein the field oxide layer (1) does not extend laterally from the trench over the upper surface of the substrate; (2) does not contact the gate oxide layers of the local gate structures; and (3) extends upwardly from the trench to a field oxide level between the level of the upper surface of the substrate and the level of an upper surface of the first gate layer. In these three ways, Poppert et al. teaches away from claim 22 and also teaches away from Park et al. and Noguchi et al.. Thus, there is no motivation to combine the teachings of Poppert et al. with the teachings of either Park et al. or Noguchi et al. to arrive at Applicants' invention.

Finally, Applicants respectfully submit that there is no motivation to combine the teachings of Park et al. or Noguchi et al. with the teachings of Poppert et al.. The mere fact that references can be combined does not render the resultant combination obvious unless the prior art also objectively suggests the desirability of the resulting combination. Because Park et al. and Noguchi et al. involve a LOCOS process that does not involve forming a trench in a substrate and produces the familiar "birds beak" field oxide shape, and Poppert et al. teaches the opposing approach of using a trench isolation process, persons of ordinary skill in the art would not be motivated to combine the teachings of Park et al. or Noguchi et al. with those of Poppert et al.. Furthermore, because Poppert et al. teaches away from claim 22 and teaches away from Park et al. and Noguchi et al. for the reasons set forth above, there is no motivation to combine the teachings of Poppert et al. with the teachings of Park et al. or Noguchi et al.. Thus, Applicants submit that the combination of these references is the result of impermissible hindsight analysis.

Claims 24-25 and 35-37 depend from claim 22 and are patentable over the cited references for the same reasons as claim 22 and also due to additional limitations contained in those claims. For example, claim 24 recites the microelectronic device of claim 22, further comprising a silicide layer formed on the adhesion layer. Similarly, claim 25 recites the microelectronic device of claim 22, further comprising a conductive layer formed on the adhesion layer. Claim 36 recites the microelectronic device of claim 22 wherein the field oxide

level is less than or equal to approximately one half the distance between the upper surface of the substrate and the upper surface of the first gate layer. Finally, claim 37 recites the microelectronic device of claim 24 wherein the field oxide level is less than or equal to approximately one half the distance between the upper surface of the substrate and the upper surface of the silicide layer. These additional limitations are also not taught or suggested by the teachings of the cited references, as admitted by the Examiner.

Claims 26-27

Similarly, claim 26 recites a microelectronic device comprising a microelectronic substrate having a trench formed in a surface thereof, the trench extending into the substrate substantially perpendicularly to the surface of the substrate; a field oxide in the trench, *the field oxide having sides that are substantially straight and substantially parallel from a bottom of the trench to a top surface of the field oxide, the substantially straight sides projecting outwardly from the trench beyond the surface of the substrate substantially perpendicularly to the surface of the substrate and not extending laterally from the trench over the surface of the substrate*; and a component formed on the field oxide, the component extending from the field oxide by a height at least equal to approximately two times a height that the field oxide extends from the trench beyond the surface of the substrate. (emphasis added).

As described more fully above, the combination of Park et al. and Poppert et al., as well as the combination of Noguchi et al. and Poppert et al., does not disclose, teach or fairly suggest the microelectronics device recited in claim 26. Specifically, the combination of cited references does not teach or suggest a microelectronics device including a field oxide layer *having sides that are substantially straight and substantially parallel from a bottom of the trench to a top surface of the field oxide*, or that the *substantially straight sides projecting outwardly from the trench beyond the surface of the substrate substantially perpendicularly to the surface of the substrate and not extending laterally from the trench over the surface of the substrate.* According to both Park et al. and Noguchi et al., the sides of the field oxide layer 3 are not substantially parallel from a bottom of the trench to a top surface of the field oxide, but rather, have a rounded or "bird's beak" shape typical of conventional LOCOS processes. Similarly, Poppert et al. teaches that the silicon dioxide portions 40 are engaged with the silicon dioxide

region 48 and extend outwardly over the sides of the trench 46. Therefore, the combination of Park et al. in view of Poppert et al., as well as the combination of Noguchi et al. in view of Poppert et al., fails to teach or suggest the assembly recited in claim 26.

Also, as described above, Poppert et al. teaches away from the assemblies recited in claim 26. Specifically, Poppert et al. teaches away from structures wherein the field oxide layer (1) does not extend laterally from the trench over the upper surface of the substrate; (2) does not contact the gate oxide layers of the local gate structures; and (3) extends upwardly from the trench to a field oxide level between the level of the upper surface of the substrate and the level of an upper surface of the first gate layer. In these three ways, Poppert et al. teaches away from claim 26 and teaches away from Park et al. and Noguchi et al.. Thus, there is no motivation to combine the teachings of Poppert et al. with the teachings of Park et al. or Noguchi et al. to arrive at Applicants' invention.

Also, as stated above, Applicants respectfully submit that there is no motivation to combine the teachings of Park et al. or Noguchi et al. with the teachings of Poppert et al.. Because Park et al. and Noguchi et al. teach processes which are opposed to the process taught by Poppert et al., persons of ordinary skill in the art would not be motivated to combine the teachings of Park et al. or Noguchi et al. with those of Poppert et al.. Furthermore, because Poppert et al. teaches away from claim 26 and teaches away from Park et al. and Noguchi et al. for the reasons set forth above, there is no motivation to combine the teachings of Poppert et al. with the teachings of Park et al. or Noguchi et al.. Thus, Applicants submit that the combination of these references is the result of impermissible hindsight analysis.

Claim 27 depends from claim 26 and is patentable over the cited references for the same reasons as claim 26.

Claims 28-29

Claim 28 recites a microelectronic device comprising a microelectronic substrate having a trench formed in a surface thereof, the trench extending into the substrate substantially perpendicularly to the surface of the substrate; a field oxide in the trench, *the field oxide having sides that are substantially straight and substantially parallel from a bottom of the trench to a top surface of the field oxide, the substantially straight sides extending from the trench beyond*

the surface of the substrate substantially perpendicularly to the surface of the substrate and not extending laterally from the trench over the surface of the substrate; and a gate structure formed on the substrate, the gate structure extending from the field oxide by a height at least equal to approximately two times a height that the field oxide extends from the trench beyond the surface of the substrate, the field oxide not contacting any portion of the gate structure. (emphasis added).

Again, the combination of Park et al. or Noguchi et al. with Poppert et al. does not disclose, teach or fairly suggest the microelectronics device recited in claim 28. Specifically, the combination of cited references does not teach or suggest a microelectronics device including a field oxide layer *having sides that are substantially straight and substantially parallel from a bottom of the trench to a top surface of the field oxide*, or that *the substantially straight sides extending from the trench beyond the surface of the substrate substantially perpendicularly to the surface of the substrate and not extending laterally from the trench over the surface of the substrate.* According to both Park et al. and Noguchi et al., the sides of the field oxide layer 3 are not substantially parallel from a bottom of the trench to a top surface of the field oxide, but rather, have a rounded or "bird's beak" shape typical of conventional LOCOS processes. Similarly, Poppert et al. teaches that the silicon dioxide portions 40 are engaged with the silicon dioxide region 48 and extend outwardly over the sides of the trench 46. Therefore, the combination of Park et al. in view of Poppert et al., as well as the combination of Noguchi et al. in view of Poppert et al., fails to teach or suggest the assembly recited in claim 28.

Also, as described above, Poppert et al. teaches away from the assemblies recited in claim 28. Specifically, Poppert et al. teaches away from structures wherein the field oxide layer (1) does not extend laterally from the trench over the upper surface of the substrate; (2) does not contact the gate oxide layers of the local gate structures; and (3) extends upwardly from the trench to a field oxide level between the level of the upper surface of the substrate and the level of an upper surface of the first gate layer. In these three ways, Poppert et al. teaches away from claim 28 and teaches away from Park et al. and Noguchi et al.. Thus, there is no motivation to combine the teachings of Poppert et al. with the teachings of Park et al. or Noguchi et al. to arrive at Applicants' invention.

Also, as stated above, Applicants respectfully submit that there is no motivation to combine the teachings of Park et al. or Noguchi et al. with the teachings of Poppert et al.. Because Park et al. and Noguchi et al. teach processes which are opposed to the process taught by Poppert et al., persons of ordinary skill in the art would not be motivated to combine the teachings of Park et al. or Noguchi et al. with those of Poppert et al.. Furthermore, because Poppert et al. teaches away from claim 28 and teaches away from Park et al. and Noguchi et al. for the reasons set forth above, there is no motivation to combine the teachings of Poppert et al. with the teachings of Park et al. or Noguchi et al.. Thus, Applicants submit that the combination of these references is the result of impermissible hindsight analysis.

Claim 29 depends from claim 28 and is patentable over the cited references for the same reasons as claim 28.

<u>Claims 30-31</u>

Similarly, claim 30 recites a microelectronic device comprising a microelectronic substrate having a recess formed in a surface thereof, the recess extending into the substrate substantially perpendicularly to the surface of the substrate; and *a field oxide deposited in the recess, the field oxide having sides that are substantially straight and substantially parallel from a bottom of the recess to a top surface of the field oxide, the substantially straight sides extending substantially perpendicularly to the surface of the substrate from the recess beyond the surface of the substrate* by a height which is less than or equal to approximately one half of a height of a component formed on the field oxide, *the field oxide not extending laterally from the recess over the surface of the substrate.* (emphasis added).

Again, the combination of Park et al. or Noguchi et al. with Poppert et al. does not disclose, teach or fairly suggest the microelectronics device recited in claim 30. Specifically, the combination of cited references does not teach or suggest a microelectronics device including a field oxide layer *having sides that are substantially straight and substantially parallel from a bottom of the recess to a top surface of the field oxide, the substantially straight sides extending substantially perpendicularly to the surface of the substrate from the recess beyond the surface of the substrate*, or that *the field oxide not extending laterally from the recess over the surface of the substrate.* According to both Park et al. and Noguchi et al., the sides of the field oxide layer 3 are not substantially parallel from a bottom of the trench to a top surface of the field oxide, but

rather, have a rounded or "bird's beak" shape typical of conventional LOCOS processes. Similarly, Poppert et al. teaches that the silicon dioxide portions 40 are engaged with the silicon dioxide region 48 and extend outwardly over the sides of the trench 46. Therefore, the combination of Park et al. in view of Poppert et al., as well as the combination of Noguchi et al. in view of Poppert et al., fails to teach or suggest the assembly recited in claim 30.

Also, as described above, Poppert et al. teaches away from the assemblies recited in claim 30. Specifically, Poppert et al. teaches away from structures wherein the field oxide layer (1) does not extend laterally from the trench over the upper surface of the substrate; (2) does not contact the gate oxide layers of the local gate structures; and (3) extends upwardly from the trench to a field oxide level between the level of the upper surface of the substrate and the level of an upper surface of the first gate layer. In these three ways, Poppert et al. teaches away from claim 30 and teaches away from Park et al. and Noguchi et al.. Thus, there is no motivation to combine the teachings of Poppert et al. with the teachings of Park et al. or Noguchi et al. to arrive at Applicants' invention.

Also, as stated above, Applicants respectfully submit that there is no motivation to combine the teachings of Park et al. or Noguchi et al. with the teachings of Poppert et al.. Because Park et al. and Noguchi et al. teach processes which are opposed to the process taught by Poppert et al., persons of ordinary skill in the art would not be motivated to combine the teachings of Park et al. or Noguchi et al. with those of Poppert et al.. Furthermore, because Poppert et al. teaches away from claim 30 and teaches away from Park et al. and Noguchi et al. for the reasons set forth above, there is no motivation to combine the teachings of Poppert et al. with the teachings of Park et al. or Noguchi et al.. Thus, Applicants submit that the combination of these references is the result of impermissible hindsight analysis.

Claim 31 depends from claim 30 and is patentable over the cited references for the same reasons as claim 30.

Claims 32-33

Claim 32 recites a microelectronic device comprising a microelectronic substrate having a trench formed in a surface thereof; a gate structure formed on the substrate, the gate structure including a gate oxide layer formed on the microelectronic substrate, a first gate layer formed on the gate oxide layer, an adhesion layer formed on the first gate layer, and a conductive

layer formed on the adhesion layer; and a field oxide deposited in the trench, *the field oxide extending substantially perpendicularly to the surface of the substrate from the trench beyond the surface of the substrate by a height which is less than or equal to approximately one half of a height of the gate structure formed on the substrate, the field oxide having sides that are substantially straight and substantially parallel from a bottom of the trench to a top surface of the field oxide, the substantially straight sides not contacting the gate oxide layer and not extending laterally from the recess over the surface of the substrate*. (emphasis added).

Again, the combination of Park et al. or Noguchi et al. with Poppert et al. does not disclose, teach or fairly suggest the microelectronics device recited in claim 32. Specifically, the combination of cited references does not teach or suggest a microelectronics device including a field oxide *extending substantially perpendicularly to the surface of the substrate from the trench beyond the surface of the substrate*, or that *the field oxide having sides that are substantially straight and substantially parallel from a bottom of the trench to a top surface of the field oxide*, or that *the substantially straight sides not contacting the gate oxide layer and not extending laterally from the recess over the surface of the substrate*. According to both Park et al. and Noguchi et al., the sides of the field oxide layer 3 are not substantially parallel from a bottom of the trench to a top surface of the field oxide, but rather, have a rounded or "bird's beak" shape typical of conventional LOCOS processes. Similarly, Poppert et al. teaches that the silicon dioxide portions 40 are engaged with the silicon dioxide region 48 and extend outwardly over the sides of the trench 46. Therefore, the combination of Park et al. in view of Poppert et al., as well as the combination of Noguchi et al. in view of Poppert et al., fails to teach or suggest the assembly recited in claim 32.

Also, as described above, Poppert et al. teaches away from the assemblies recited in claim 32. Specifically, Poppert et al. teaches away from structures wherein the field oxide layer (1) does not extend laterally from the trench over the upper surface of the substrate; (2) does not contact the gate oxide layers of the local gate structures; and (3) extends upwardly from the trench to a field oxide level between the level of the upper surface of the substrate and the level of an upper surface of the first gate layer. In these three ways, Poppert et al. teaches away from claim 32 and teaches away from Park et al. and Noguchi et al.. Thus, there is no motivation

to combine the teachings of Poppert et al. with the teachings of Park et al. or Noguchi et al. to arrive at Applicants' invention.

Also, as stated above, Applicants respectfully submit that there is no motivation to combine the teachings of Park et al. or Noguchi et al. with the teachings of Poppert et al.. Because Park et al. and Noguchi et al. teach processes which are opposed to the process taught by Poppert et al., persons of ordinary skill in the art would not be motivated to combine the teachings of Park et al. or Noguchi et al. with those of Poppert et al.. Furthermore, because Poppert et al. teaches away from claim 32 and teaches away from Park et al. and Noguchi et al. for the reasons set forth above, there is no motivation to combine the teachings of Poppert et al. with the teachings of Park et al. or Noguchi et al.. Thus, Applicants submit that the combination of these references is the result of impermissible hindsight analysis.

Claim 33 depends from claim 32 and is patentable over the teachings of Manning and Park et al. for the same reasons as claim 32.

<u>Claim 34</u>

Claim 34 recites a microelectronic device, comprising a microelectronic substrate having a surface with a trench formed therein; a field oxide within the trench and *having sides that are substantially straight and substantially parallel from a bottom of the trench to a top surface of the field oxide, the substantially straight sides projecting therefrom substantially perpendicularly to the surface of the substrate by a height which is small enough to prevent the formation of spacers adjacent the field oxide, the field oxide not extending laterally from the trench over the surface of the substrate*; and a component formed on the field oxide. (emphasis added).

Again, the combination of Park et al. or Noguchi et al. with Poppert et al. does not disclose, teach or fairly suggest the microelectronics device recited in claim 34. Specifically, the combination of cited references does not teach or suggest a microelectronics device including a field oxide layer *having sides that are substantially straight and substantially parallel from a bottom of the trench to a top surface of the field oxide*, or that *the substantially straight sides projecting therefrom substantially perpendicularly to the surface of the substrate by a height which is small enough to prevent the formation of spacers adjacent the field oxide*, or that *the field oxide not extending laterally from the trench over the surface of the substrate*. According

to both Park et al. and Noguchi et al., the sides of the field oxide layer 3 are not substantially parallel from a bottom of the trench to a top surface of the field oxide, but rather, have a rounded or "bird's beak" shape typical of conventional LOCOS processes. Similarly, Poppert et al. teaches that the silicon dioxide portions 40 are engaged with the silicon dioxide region 48 and extend outwardly over the sides of the trench 46. Therefore, the combination of Park et al. in view of Poppert et al., as well as the combination of Noguchi et al. in view of Poppert et al., fails to teach or suggest the assembly recited in claim 34.

Also, as described above, Poppert et al. teaches away from the assemblies recited in claim 34. Specifically, Poppert et al. teaches away from structures wherein the field oxide layer (1) does not extend laterally from the trench over the upper surface of the substrate; (2) does not contact the gate oxide layers of the local gate structures; and (3) extends upwardly from the trench to a field oxide level between the level of the upper surface of the substrate and the level of an upper surface of the first gate layer. In these three ways, Poppert et al. teaches away from claim 34 and teaches away from Park et al. and Noguchi et al.. Thus, there is no motivation to combine the teachings of Poppert et al. with the teachings of Park et al. or Noguchi et al. to arrive at Applicants' invention.

Also, as stated above, Applicants respectfully submit that there is no motivation to combine the teachings of Park et al. or Noguchi et al. with the teachings of Poppert et al.. Because Park et al. and Noguchi et al. teach processes which are opposed to the process taught by Poppert et al., persons of ordinary skill in the art would not be motivated to combine the teachings of Park et al. or Noguchi et al. with those of Poppert et al.. Furthermore, because Poppert et al. teaches away from claim 34 and teaches away from Park et al. and Noguchi et al. for the reasons set forth above, there is no motivation to combine the teachings of Poppert et al. with the teachings of Park et al. or Noguchi et al.. Thus, Applicants submit that the combination of these references is the result of impermissible hindsight analysis.

For the foregoing reasons, Applicants respectfully request reconsideration and withdrawal of the rejection of claims 22 and 24-37 under 35 U.S.C. § 103(a) as being unpatentable over Park et al. in view of Poppert et al., and the rejection of claims 22, 24, 25, 28, 29, and 32-37 under 35 U.S.C. § 103(a) as being unpatentable over Noguchi et al. in view of Poppert et al..

CONCLUSION

In light of the foregoing remarks, Applicants believe that pending claims 22 and 24-37 are in condition for allowance, and that action is respectfully requested. In accordance with 37 CFR § 1.121, attached hereto is an attached page entitled "Version with Markings to Show Changes Made" showing the specific changes made to the claims by the current amendment. If there are any remaining matters that can be handled in a telephone conference, the Examiner is invited to telephone the undersigned attorney, Dale C. Barr, at (206) 903-8745.

Respectfully submitted,
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VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Specification:

In the section entitled "CROSS REFERENCE TO RELATED APPLICATION," please delete the existing sentence and insert in its place the following sentence"

-- This application is a divisional of pending United States Patent Application No. 09/032,321, filed February 27, 1998, and issued as United States Patent No. 6,107,157 on August 22, 2000. ---